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First record of digenea parasites from the family Hemiuridae for the *Sardinella aurita* in coastal waters of Lattakia city – Syria

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ABSTRACT

The *Sardinella aurita* is one of the most desirable fish for consumption in general, because of its high nutritional value. Moreover, is one of the richest fish in iodine. Severe infection with pathogens, especially parasites, can cause various functional disorders and this affects the quality of its meat. Fish were collected during July and August from two fishing areas and the total number of fish examined was 90 individuals. Parasites have been isolated from the digestive system in this research are: *Parahemiurus merus* \ *Lecithochirium lueh*. Therefore, the identification of parasites that parasitize on *s. aurita* is of great importance, as we found (during current research) the two digenea parasite of the digestive system. The present study was considered as the first report of digenea from *S. aurita* in the Syrian water.

Keywords: Syrian water, *Sardinella aurita*, *Lecithochiriinae Lühe*, *Parahemiurus merus*.

1. INTRODUCTION

Fish is of great importance to humans. They are highly valued food sources in many nations of the year. They are the archetypes of a large number of parasites that play an important role in fish life, especially in intensive farming conditions as they are transmitted from affected fish individuals to healthy individuals. Parasites also negatively affect fish's health status and make them less immune and more susceptible to other diseases such as fungal and other diseases, resulting in reduced growth adversely affecting fish productivity. Parasites may cause mechanical damage while moving within tissues, hindering growth and reproduction and some of the other parasites are pathogenic and many of them are transmitted to them by eating raw fish that aren't well cooked (Hoffmann, 1999).

Parasitic diseases are divided by place of infection into external and internal and a large section of parasitic injuries can be in the form of latent injuries without showing pathological symptoms on the ischemic. The importance of these injuries is that they play a significant role in reducing the immunity of the knife fish so that they become more willing to develop other diseases such as viruses and thus reduce their growth and productivity.

Parasitic diseases constitute 80% of the diseases of warm water fish caused by the first parasitic animals and respectively (Duijn, 1956; Fijan, 1983) Many studies in Syria have been interested in classifying external and internal parasite species for freshwater fish and studying the impact of environmental factors on the spread and distribution of parasites (Dayoub and Salman, 2014), but studies that have been interested in marine parasites are few, the first being in 2010 where some external parasite species have been identified (Hassan et al., 2010). This study is the first to be concerned with the intrinsic parasites of brominated *sardines*.

Research objectives and importance

The importance of the research comes from the fact that studies on internal and external marine fish parasites in Syria are relatively few and that for the first time it is conducting research on intrinsic parasites in economically important sardines *Sardinella aurita* and contributed to a new addition to the Biodiversity Information Bank, in particular the possibility of registering new parasites in intermediate and final Ethiopia as well as parasite and the possibility of describing new parasitic species for the first time in Syria's maritime waters. The study aimed to detect parasitic infections in the brominated sarin fish in the seawater of the coast of Latakia.

2. METHODS AND MATERIALS

Sardines are considered fatty fish characterized by their small size and their many health benefits and are considered economic folk fish and it is worth mentioning that the name of sardines came from the Italian island of Sardinia because of its abundant availability (Bachiller et al., 2021).



Figure 1 Sardine sample

90 individuals from various fishing sites from Latakia's shore were gathered between the fishing port and Hani's son. Samples were combined between the seventh month and the end of the eighth month in 2022 and transferred to the Fish Laboratory of the Higher Institute of Marine Research from two regions:

The Ibn Hani area

It is located about 10 km north of Latakia. This area is located near the Higher Institute of Marine Research, features a rocky beach and is relatively far from the sources of oil pollution but is relatively contaminated in the summer swimming months by the sanitation water of nearby tourist resorts (Figure 2).



Figure 2 The Ibn Hani area

Relative to the Port of Fishing and Picnic area

This area is the main entrance to the port of Latakia and is quite specific, with an area of approximately 2km and a drainage drain that serves the city of Latakia and is therefore an area with organic and oil pollution.



Figure 3 The Port of Fishing and Picnic area

Morphometric measurements of the thoughtful fish were taken, the average length of sardines in the Ibn Hana area (21.9m) and the average weight was (53g), the average length (14.3m) and the average weight (28.6g) in the fishing and picnic port area. The fish were then explored according to the method mentioned by the researchers Amlacher, (1976), Lasee, (2004). Amlacher made a longitudinal incision in the abdominal midline from the beginning of the fish's head to the end of the anus and then made another incision from the end of the first incision to the cover of the wrap. The internal organs became exposed for examination. They were examined with the naked eye and then using a magnifying glass to see the parasitic hands (Figure 4 and 5).



Figure 4 fish weighing device

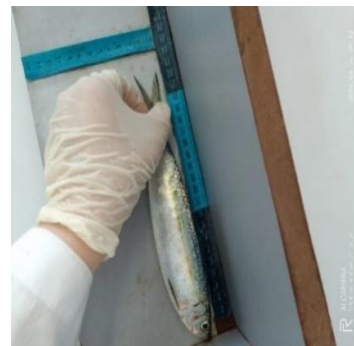


Figure 5 fish length device

Parasites isolated and established with alcohol 70% or formol 0.4% concentration, after which parasitic samples were dyed using lactic acid according to researchers (Amlacher, 1976; Lucky, 1977; Pritchard and Kruse, 1982). The isolated parasite type was identified in this study after its depiction by relying on a number of global classification keys that cared about the external and internal formal qualities of the isolated parasite, the front and rear ends of the body and others (Bykhovskaya et al., 1964; Möller and Anders, 1986; Anderson, 1992; Moravec, 1994; Berland, 1998).

3. RESULTS AND DISCUSSION

Isolate the first type *Lecithochiriinae* Lühe which joins the Digenea row for the first time from the digestive tract of brominated sardines' fish and follows the following classification:

Table 1 Classification of the first type of Digenea parasites by Worms taxon (<https://www.marinespecies.org/>)

	<i>Lecithochirium</i> Lühe
Kingdom	<u>Animalia</u>
Phylum	Platyhelminthes
Class	Digenea

Order	Plagiorchiida
Family	Hemiuridae
Genus	Lecithochirium
Species	Lecithochirium Lühe

1-Lecithochiriinae Lühe

Adult worms showed an elongated body with pointed front wide limbs and hind limbs. The measurement of the adult worm body with tail stretch is estimated at about 1.95mm, Its width is estimated to be 0.33x, it has two sizes, one in front of me and the other is absorbed orally and the other is abdominal near the front end, This type of parasite is characterized by a relatively large abdominal scale containing a sophisticated pharynx, containing a prostate gland, as well as having clear testicles, There is a sperm whistle near the front end of the parasite's body, which has been recommended as a thick-walled, narrow prolonged part. A circular bleach, located on the right of the parasite's body, has ventricular pores that subtract eggs and sperm from the mouth outwards.

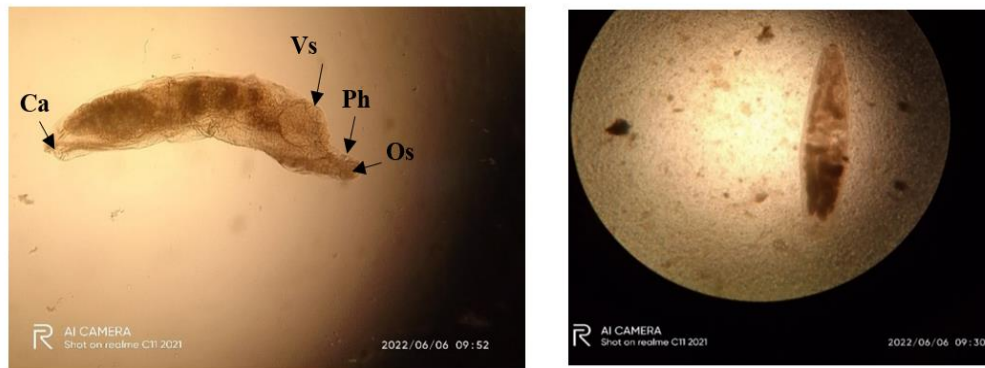


Figure 6 Picture of Lecithochiriinae Lühe, Os: oral sucker, ph: pharynx, Vs; ventral sucker, Ca: Caudal appendage.

Isolate the first type *Parahemiurus merus* which joins Digenea row for the first time also from the gastrointestinal tract of brominated sardines' fish and follows the following classification:

Table 2 Classification of the second type of Digenea parasites by Worms taxon (<https://www.marinespecies.org/>)

	<i>Parahemiurus merus</i>
Kingdom	Animalia
Phylum	Platyhelminthes
Class	Digenea
Order	Plagiorchiida
Family	Hemiuridae
Genus	<i>Parahemiurus</i>
Species	<i>Parahemiurus merus</i>

It also agrees with the researcher (Mattos Almeida *et al.*, 2009), and the specifications of this parasite type are:

2-Parahemiurusmerus

The body is rolling cylindrical, the body is very sophisticated, the surface of the body is unarmed and folded (frills), there are no cavities in the body, the lobe before the mouth is distinct, the oral scale is rotated, there is nothing before the pharynx and it falls under the oral scale, the esophagus is short, the sensation ends randomly, inside or outside the body. There are symmetrical testicles in the body of this spiral oval-shaped parasite and prostate gland, bleach after testicle, round to the oval. Regarding the structure of the reproductive system. The parameters of the size of organisms available in adults vary greatly, which may be associated with their prolonged growth in the host organism.

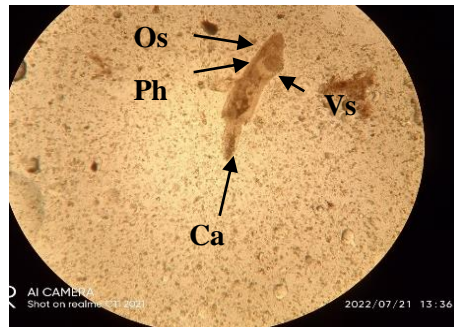


Figure 7 Picture of *Parahemiurus merus*, Os: oral sucker, ph.: pharynx, Vs; ventral sucker, Ca: Caudal appendage.

The types of parasites belonging to the digenea class registered here have the same general form of his family but have different characteristics from their members.

The life cycle of *p. merus* and *I. luhe*: (Gonchar et al, 2016):

First Rediae

Divided into four categories:

Young rediae(yr)- rediae with cercarial embryos(rce)- rediae with developing cercariae and embryos(rc)- degenerating rediae(dr)

Both yr. and race can move in a special motion. These ridges in different age groups also contain a mouth opening and are located at the end of the front part of the body followed by a float and then an oesophagus and opens to a sack-like emotion. The abdominal scale is absent. They are abundant in mollusks and *Reydat* lives within the ventricles of the foot containing reydes of the age of rc/rce within the bloody cavity.

Second Cercaria

Cercariae trioculate, the absent pharyngeal and shows the abdominal scale, as a tail ephesian channel attached to the cercariae bladder shows sophisticated, while in the whole cercariae, the tail secretion channel loses contact with the ephesian bladder and deteriorates, with remnants in the middle part of the tail. Cercaria leaves reads when mature. They actively move in the bloody cavity between the liver lobes and concentrate near the liver, only fully formed dyed larvae leave the mollusk host. They swim in the water column for a long time after the mollusk host leaves, then sink to the bottom and coat only after 2-4 hours, the size and shape vary depending on the maturity stage: Small, mature worms are stretched and narrow and the body's exposure increases with the growth and accumulation of eggs in the womb.

Third

Adults are placed in the sense of sea ducks (birds), until they move and explore the final host and adults show morphological differences, with respect to the structure of the reproductive system the parameters of the size of organisms available in adults vary greatly, which may be associated with their prolonged growth in the host organism.

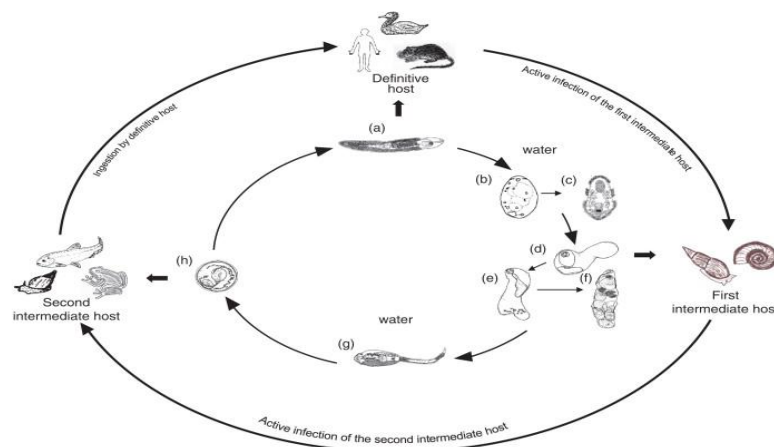


Figure 8 Life cycle of Digenea (Gonchar et al., 2016)

4. CONCLUSIONS AND RECOMMENDATIONS

The *Parahemiurus merus* and *Lecithochiriinae* Lühe were first recorded on the Syrian coast of the digestive tract of *S. aurita*. Periodic field studies to identify changes in the spread of parasites in Syrian maritime waters and to identify vital environmental factors that help the spread of these parasites.

Ethical approval

Sardinella aurita in coastal waters of Lattakia city – Syria was used in the study. The Animal ethical guidelines are followed in the study for species observation & identification.

Funding

This study has not received any external funding.

Conflicts of interests

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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